Retention and Patient Satisfaction of Conventional Over Simplified Non-Balanced Maxillary Removable Complete Dentures

Keywords

Patient Satisfaction
Retention
Conventional Complete Dentures
Simplified Complete Denture

Authors

Shanmugapriya Ponmani *
(MDS)

Naveen Gopi Chander §
(MDS, DNB, FDSRCPS, Ph.D)

Kuttae Vishwanathan Anitha §
(MDS)

Muthukumar Balasubramanium ‡
(MDS)

Address for Correspondence

Naveen Gopi Chander §

Email: drgopichander@gmail.com

* *Postgraduate student, Department of Prosthodontics, SRM Dental College, Chennai, Tamilnadu, India*

§ *Professor, Department of Prosthodontics, SRM Dental College, Chennai, Tamilnadu, India*

‡ *Professor and Head of the Department, Department of Prosthodontics, SRM Dental College, Chennai, Tamilnadu, India.*

Received: 02.05.2023
Accepted: 02.11.2023

doi: 10.1922/EJPRD_2568Ponmani07

ABSTRACT

Aim: Insufficient evidence is available in quantifying the retention between simplified and conventional non-balanced dentures. The aim of the study was to quantify and compare the maxillary denture retention and patient satisfaction between conventional and simplified removable non-balanced complete dentures. Method: This randomized clinical trial recruited 44 patients (n=22) with definitive criteria. Simplified and conventional non-balanced complete dentures were fabricated for the intervention groups. The denture retention of maxillary complete dentures was assessed with a dynamometer and patient satisfaction with a visual analogue scale. The mean retention of maxillary denture and satisfaction were recorded at 0-,3-, and 6 – month intervals. The data were statistically analyzed. (α=.05). Results: The mean ±SD of retention for conventional denture at 0, 3, and 6 months by dynamometer ranged from 122 ± 1.64 N to 121 ± 1.57 N and 111 ±1.45N to 110±1.97 N for the simplified denture. The mean ±SD of visual analogue score varied between 9.45±0.35 to 7.19± 0.69 for conventional dentures and 8.00 ±1.39 to 6.81±0.82 for simplified dentures. The repeated ANOVA, t-test and post-hoc Bonferroni revealed statistically significant differences between the two types of denture. (P<.05) Conclusion: Numerical retention and satisfaction were higher in conventional non-balanced dentures than simplified dentures.

INTRODUCTION

Edentulism is a prevalent concern, having a significant impact on the oral health and quality of life of the individuals.[1,2] The etiologic of edentulism is diverse, it includes genetics, socioeconomic factors, trauma, and dental diseases. Early rehabilitation with prosthesis improves the self-confidence, psychosocial acceptance, better chewing ability, speech, and overall health in the elderly population.[2,3] Among the prosthetic options, the removable complete dentures (RCD) is the simplest and less intensive procedure.[4]

The most common methods of RCD fabrication are conventional and simplified techniques.[5-7] The conventional denture techniques is successfully documented in the literature with various advantages but involves more clinical appointments than simplified denture.[8] The simplified technique requiring fewer clinical visits, shorter fabrication time, cost-effective and

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

material-saving.[9-15] Several modifications of simplified complete dentures have been suggested in the literature but it primarily varies with the conventional procedure with single impression procedures.[16-20] Studies demonstrated similar functional quality, masticatory performance, oral health-related quality of life, and patient satisfaction between the conventional and simplified procedure.[21-25] However, the choice between these two techniques remains subjective and is based on personal preference.

The literature is less evidenced on the superiority of retention and patient satisfaction between these 2 techniques. A randomized controlled trial (RCT) was planned to evaluate the denture retention and patient satisfaction at various time intervals between these 2 techniques in the Indian population. The null hypothesis of the study was that there is no difference in denture retention and patient satisfaction between conventional and simplified denture fabrication techniques.

METHODS

The clinical study was approved by the institutional review board. (SRMDC/IRB/2020/MDS/No.207). Informed consent was obtained from all the study participants. The study's inclusion criteria were based on a number of variables, including tongue position, frenal attachment, maxillomandibular connection, kind of muscle attachments, residual ridge height, and others. Class 1 edentulous arches of the Prosthodontic Diagnostic Index (PDI) were included in the study based on the aforementioned variables. Individuals with a single edentulous arch, a PDI II, PDI III, or PDI IV classification, and other medical disorders such autoimmune diseases or those undergoing radiation therapy were excluded.[9]

A randomized controlled trial with two study groups—Group C (conventional) and Group S (simplified denture) was designed. A sample size of 22 patients per group was determined to have an 80% power and a 5% alpha error. The randomization was achieved with a computer-generated sequence and the participants were allotted to the group by the expert prosthodontist. The trial was single-blinded, the patients were unaware of their group assignment to the intervention. The dentures were fabricated and the outcomes of retention, oral health quality of life were evaluated after 0-, 3-, and 6-months. *(Figure 1)*

The fabrication of dentures for Group C (Conventional dentures) participants was performed according to conventional clinical and laboratory procedures. Initially, a preliminary impression is taken using irreversible hydrocolloid material (Zelgan, Dentsply) in a stainless-steel stock tray. Subsequently, border moulding with green stick compound (DPI Pinnacle tracing sticks; Dental Products of India) and a secondary impression are made with medium body addition silicone impression material (Aquasil Monophase; Dentsply Sirona). The recording of the maxillomandibular relationship is carried out without a facebow transfer, using a non-adjustable articulator. A trial denture verification was made, and patients received their dentures at the fifth appointment following the conventional laboratory technique for heat cure denture base resin.

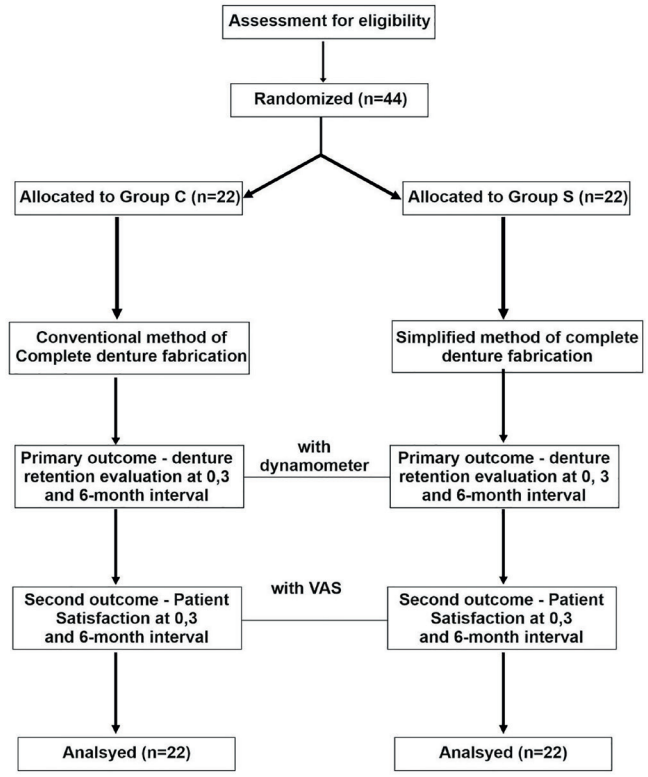

Figure 1: Study flow chart.

A single impression appointment, with irreversible hydrocolloid material (Zelgan, Dentsply) in a stainless-steel stock tray was made on participants in Group S (Simplified complete dentures). A master cast was produced from this impression, and the denture base was constructed. The recording of the maxillomandibular relationship was achieved without a facebow transfer, utilizing a non-adjustable articulator. Denture try-in was done and placement was scheduled for the fourth clinical appointment following the conventional laboratory processing technique. *(Figure 2)*

On the day of denture placement, the overextensions or occlusal discrepancies were identified and corrected. The participants were instructed on post insertion denture instructions. The study analysis was initiated with no complaints of patient after a washout period of 2 weeks. The outcome measurements were estimated analysis at 0-, 3-,and 6-months. The denture retention was estimated with Dynamometer (Correx Tension Gauge, Haag-Striet Diagnostics). The instrument applied pressure in the anterior and posterior frenal areas and measured the quantitative force in N cm. The mean of two forces were recorded at 0-,3-, and 6-months. Visual analogue scale was used to estimate the participants satisfaction. The participants were requested the mark their preference on the scale that ranged from total dissatisfaction to complete satisfaction. The data collected from the study outcomes were evaluated for normality through the Shapiro-Wilk test. The data exhibited a normal distribution and subsequently Repeated Measures ANOVA, t-tests, and post-hoc Bonferroni tests were applied for analysis.

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

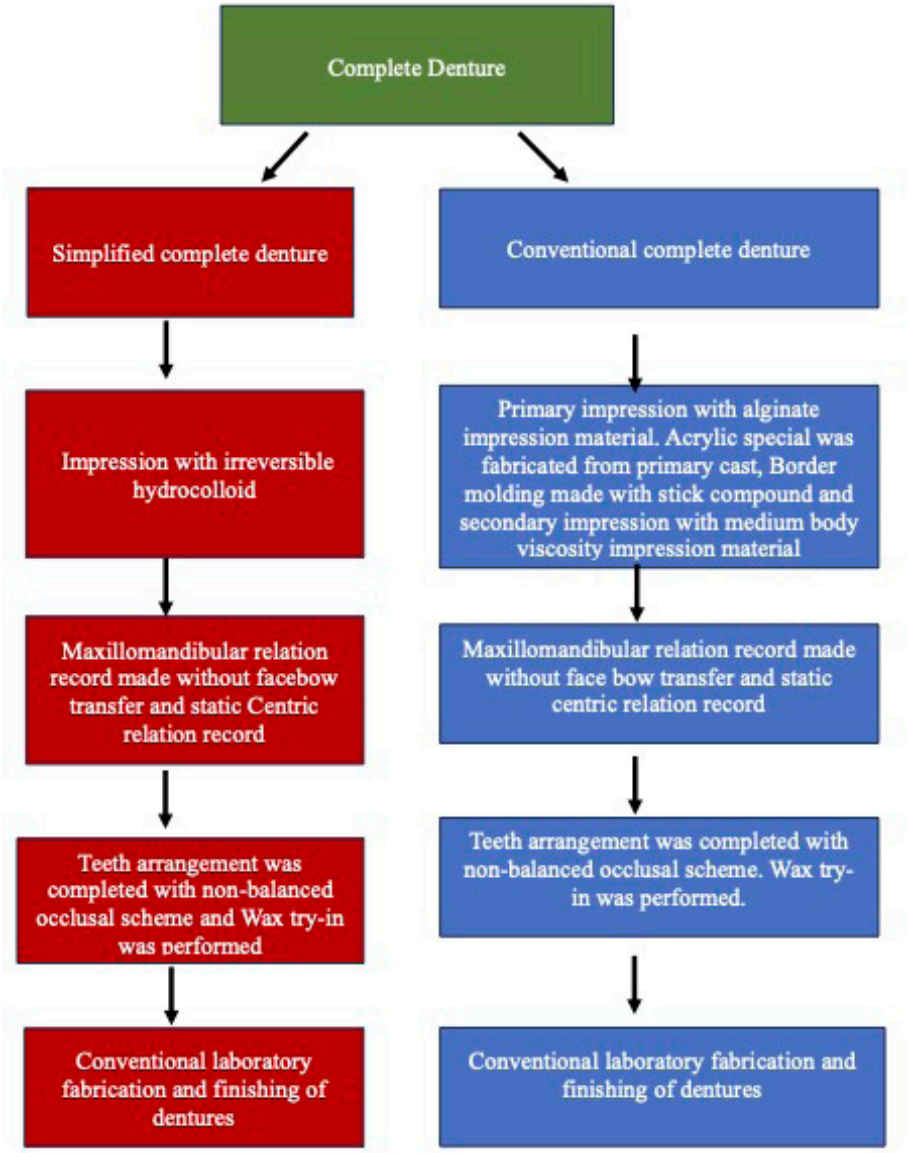

Figure 2: Illustration of procedures followed in denture fabrication.

RESULTS

The conventional and simplified denture had similar age and gender distribution with an average age of 58.09 ±5.26 years. *(Table 1)* The participants in the conventional group had mean retention values of 121.73 ±1.64 N/cm (0- month), 120.91 ±1.60 N/cm (3-month), and 120.55 ±1.57 N/cm (6-month). The mean VAS scores for the participants of conventional group ranged from 7.19 ±0.69 to 9.45 ±0.35. The mean retention values of the participants for simplified dentures for various time intervals were 110.77 ± 1.44 N/cm (0-month), 110.04 ± 1.67 N/cm (3-month), and 109.59 ± 1.97 N/cm (6-month). The VAS scores of the participants in the simplified group were between 8.00 ±1.39 to 6.81 ±.82. The difference in retention between the intervention group *(Table 2)* for various time intervals was statistically significant. (P<.005) VAS comparison between the 2 groups *(Table 2)* were statistically significant between the 2 groups. (P<.001) Table 3 and 4, Post-hoc Bonferroni analysis exhibited statistically significant variations in retention and VAS scores for various time intervals.

DISCUSSION

The results of the study indicated increased denture retention with conventional over simplified method (P<.05). The null hypothesis was partially accepted as increased denture retention was observed with one over the other. The observation was supported by Mehra *et al.*[11] and Petropoulos *et al.*[12] validated that the use of two-step impression with border molding. Jo *et al.*, estimated the denture retention from the clinician perceptive and established the superiority of conventional two-step impression against single alginate impression technique.[13] In contrast, Regis *et al.*[5], Hyde *et al.*[16] presented no significant variation in quality of retention between the 2 methods in patients perceptive. Further, Carlsson *et al.*[14] recommended simplified techniques as they saved time and less expensive compared to conventional denture. Ellinger *et al* revealed 94% of dental specialists utilized irreversible hydrocolloid for final impressions.[15] The increased denture retention, with conventional method can be related to two stage impressions.[17-19] The two-stage impression technique aids

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

Table 1. Descriptive statistics of participants for the types of complete dentures.

Group	Gender	N	Minimum	Maximum	Mean ±SD
Conventional denture	F	11	49.0	65.0	58.82 ±5.21
	M	11	49.0	65.0	57.36 ±5.45
	Total	22	49.0	65.0	58.09 ±5.26
Simplified denture	F	11	46.0	65.0	58.36 ±5.87
	M	11	49.0	64.0	57.46 ±5.77
	Total	22	49.0	65.0	58.09 ±5.26

Table 2. Comparison of Retention and VAS scores between the time intervals within each group.

Group	Outcome	Time period (month)	Mean ±SD	F value	P value
Conventional denture	Retention	0	121.73±1.64	9.592	.005
		3	120.91±1.60		
		6	120.55±1.57		
	VAS	0	9.45±0.35	161.824	.000
		3	8.11±0.61		
		6	7.19±0.69		
Simplified denture	Retention	0	110.77±1.45	10.198	.004
		3	110.05±1.68		
		6	109.59±1.97		
	VAS	0	8.00±1.39	15.410	.001
		3	7.28±0.86		
		6	6.81±0.82		

in fabricating customized tray, functional molding of tissues through border molding, aids in border seal and better denture surface contact compared to simplified one-step impression technique dentures.[20-23]

The comparison of patient satisfaction between both methods showed a statistically significant preference of conventional over simplified at 0- and 3-month after denture placement. However, at end of 6-month no differences were observed between the two methods. This can be due to the denture adaptation regardless of the fabrication method.[24] Kawai *et al.*[8] and Heydecke G *et al.*[16] found similar results with the use of visual analog scale for estimating the differences between conventional versus simplified approaches. Regis *et al.*[5] found slightly better patient satisfaction with simplified approach. However, Nunez MC *et al.*[6] observed no significant variation in patient satisfaction and quality of life was reported between both the techniques. Factors such as less chairside time, minimal dental visits, reduced treatment cost play a significant role in patient satisfaction. Ye[25] perceived that one-step alginate impression with stock trays may result in over- extended flanges, pushing the mucosa and leading to thick flanges. Despite these limitations the lower cost of simplified complete denture treatment can influence patient satisfaction.

The results of the present study evidenced increased denture retention with the conventional over the simplified method ($P < 0.05$). Earlier studies showed varying results in terms of denture retention, patient satisfaction, and quality of life. This study supported the conventional method for better denture retention. The VAS patient satisfaction results showed statistically significant preference for the conventional method at

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

Table 3. Post hoc analysis for Retention and VAS scores.

Group	Outcome	Time period	Time period	Mean Difference	P value	95% CI for Difference	
						Lower Bound	Upper Bound
Conventional	Retention	0	3	.82*	.02	.14	1.50
			6	1.18*	.02	.18	2.17
		3	6	.36	.57	-.33	1.06
	VAS	0	3	1.34*	.01	.93	1.75
			6	2.27*	.01	1.80	2.73
		3	6	.93*	.00	.60	1.26
Simplified	Retention	0	3	.73*	.03	.06	1.39
			6	1.18*	.01	.22	2.15
		3	6	.46	.23	-.18	1.09
	VAS	0	3	.71*	.02	.10	1.32
			6	1.18*	.01	.40	1.97
		3	6	.47	.06	-.01	.95

Post hoc analysis was done by performing Bonferroni' s Correction. P ≤ .05 is significant. CI – Confidence interval

Table 4. Comparison of parameters between groups at each time interval.

Parameter	Group	Mean	Std deviation	Mean Difference	t value	P value	95% CI of the Difference	
							Lower	Upper
Retention at 0 month	1	121.73	1.64	10.95	23.52	0.00	10.01	11.89
	2	110.77	1.45					
Retention at 3 months	1	120.91	1.60	10.86	21.99	0.00	9.87	11.86
	2	110.05	1.68					
Retention at 6 months	1	120.55	1.57	10.96	20.43	0.00	9.87	12.04
	2	109.59	1.97					
VAS score at 0 month	1	9.45	0.35	1.46	4.77	.000	.8412	2.08
	2	8.00	1.39					
VAS score at 3 months	1	8.11	0.61	.83	3.71	.001	.3790	1.28
	2	7.28	0.86					
VAS score at 6 months	1	7.19	0.69	.37	1.63	.111	-.0893	.84
	2	6.81	0.82					

t and p values obtained from Student's t test. P value ≤ .05 is significant. CI – Confidence interval

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

0- and 3- months after denture placement, but no differences were observed at the end of the 6-month. The study results should be considered within the limitations such as shorter follow-up time, smaller sample size and confined to PDI classification-1. Estimating the study outcomes with larger sample size in other PDI classification systems, and long term follow up can widen the scope of the study in future.

The results of study showed that both intervention methods of denture fabrication are predictable. In this study Class I – PDI participants were recruited. It is unsure whether similar results can be obtained in PDI Class II or III or in highly resorbed edentulous ridge situations. Estimating additional outcomes, with objective tools from both operator's and patient's aspect can aid in better interpretation of each technique. Additionally, it is essential to assess the use of simplified techniques over conventional methods in various compromised clinical situations, alike flabby tissues and knife-edge ridges. While numerous factors can impact denture quality, this study focused on retention and patient satisfaction. Further clinical trials are necessary to gain a comprehensive understanding of simplified complete dentures.

Within the limitations of this study and from an operator's perspective it was inferred that, dentures made from conventional procedure showed better retention than those made from simplified technique. With regards to patient satisfaction at the end of 6-month period after denture placement, no differences were observed between the techniques. Thus, this simplified method of complete denture fabrication can be followed as it saved time and cost. It can be helpful for patients with limited physical mobility or those who are dependents on attenders for dental visits. However, the challenges faced by patient and clinician during and after the dental prosthetic treatment are completely different and must be accounted. Drawing conclusions from single criteria doesn't substantiate the dominance of one technique over the other. Careful patient examination and application of suitable technique is of paramount importance.

CONCLUSION

The following conclusions were made with in the limitations of the study

1. The conventional method of denture fabrication showed better retention than simplified denture.
2. No differences in patient satisfaction were observed between the 2 denture groups for the estimated 6- month period.

ACKNOWLEDGMENTS

This research did not receive grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICTS OF INTEREST

No conflicts of interest

REFERENCES

1. Felton, D.A. Edentulism and comorbid factors. *J Prosthodont.* 2009; **18**:88-96.
2. Cunha, T.R., Della Vecchia, M.P., Regis, R.R., Ribeiro, A.B., Muglia, V.A., Mestriner W. Jr. and de Souza R.F. A randomized trial on simplified and conventional methods for complete denture fabrication: masticatory performance and ability. *J Dent.* 2013; **41**:133-142.
3. Gupta, A,. Felton, D.A., Jemt, T. and Koka, S. Rehabilitation of Edentulism and Mortality: A Systematic Review. *J Prosthodont.* 2019; **28**:526-535.
4. Shah, N., Parkash, H. and Sunderam, K.R. Edentulousness, denture wear and denture need of Indian elderly--a community-based study. *J Oral Rehabil.* 2004; **31**:467-476.
5. Regis, R.R., Cunha, T.R., Della Vecchia, M.P., Ribeiro, A.B., Silva-Lovato, C.H., and de Souza R.F. A randomised trial of a simplified method for complete denture fabrication: patient perception and quality. *J Oral Rehabil.* 2013; **40**:535-545.
6. Nuñez, M.C., Silva, D.C., Barcelos, B.A. and Leles, C.R. Patient satisfaction and oral health-related quality of life after treatment with traditional and simplified protocols for complete denture construction. *Gerodontology.* 2015; **32**:247-253.
7. de Villa Camargos, G., Armenine, T.E., Paleari, A.G., Nascimento, G.M.O. and Munhoz, M.F.V. Teaching Complete Denture Procedures to Dental Students by Conventional or Simplified Methods: A Randomized Clinical Trial. *J Dent Educ.* 2019; **83**:303-313.
8. Kawai, Y., Murakami, H., Takanashi, Y., Lund, J.P. and Feine, J.S. Efficient resource use in simplified complete denture fabrication. *J Prosthodont.* 2010; **19**:512-516.
9. McGarry, T.J., Nimmo, A., Skiba, J.F., Ahlstrom, R.H., Smith, C.R. and Koumjian, J.H. Classification system for complete edentulism. The American College of Prosthodontics. *J Prosthodont.* 1999; **8**:27-39.
10. Roydhouse, R.H. The retention of dentures. *J Am Dent Assoc.* 1960; **60**:159-163.
11. Mehra, M., Vahidi, F. and Berg, R.W. A complete denture impression technique survey of postdoctoral prosthodontic programs in the United States. *J Prosthodont.* 2014; **23**:320-327.
12. Petropoulos, V.C. and Rashedi, B. Current concepts, and techniques in complete denture final impression procedures. *J Prosthodont.* 2003; **12**:280-287.
13. Jo, A., Kanazawa, M., Sato, Y., Iwaki, M., Akiba, N. and Minakuchi, S. A randomized controlled trial of the different impression methods for the complete denture fabrication: Patient reported outcomes. *J Dent.* 2015; **43**:989-996.
14. Carlsson GE. Clinical morbidity and sequelae of treatment with complete dentures. J Prosthet Dent. 1998;**79**(1):17-23. doi: 10.1016/s0022-3913(98)70120-1
15. Ellinger, C.W., Somes, G.W., Nicol, B.R., Unger, J.W. and Wesley, R.C. Patient response to variations in denture technique. Part III: Five-year subjective evaluation. *J Prosthet Dent.* 1979; **42**:127-130.
16. Hyde, T.P., Craddock, H.L., Blance, A. and Brunton, P.A. A cross-over randomized controlled trial of selective pressure impressions for lower complete dentures. *J Dent.* 2010; **38**:853-858.

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.

17. Yarapatineni, R., Vilekar, A., Kumar, J.P., Kumar, G.A., Aravind, P. and Kumar, P.A. Comparative evaluation of border molding, using two different techniques in maxillary edentulous arches - An *in vivo* study. *J Int Oral Health.* 2013; **5**:82-87.
18. Tasleem, R., Bin Saeed, M.H. and Javed, M.U. Comparison of complete denture fabricated by two different border molding materials, in terms of patients' satisfaction. *J Ayub Med Coll Abbottabad.* 2013; **25**:78-80.
19. Pachar, R.B., Singla, Y. and Kumar, P. Evaluation and comparison of the effect of different border molding materials on complete denture retention: An *in vivo* study. *J Contemp Dent Pract.* 2018; **19**:982-987.
20. Smith, D.E., Toolson, L.B., Bolender, C.L. and Lord, J.L. One-step border molding of complete denture impressions using a polyether impression material. *J Prosthet Dent.* 1979; **41**:347-351.
21. Chaffee, N.R., Cooper, L.F. and Felton, D.A. A technique for border molding edentulous impressions using vinyl polysiloxane material. *J Prosthodont.* 1999; **8**:129-134.
22. Jassim, T.K., Kareem, A.E. and Alloaibi, M.A. *In vivo* evaluation of the impact of various border molding materials and techniques on the retention of complete maxillary dentures. *Dent Med Probl* 2020; **57**:191-196.
23. Jayaraman, S., Singh, B.P., Ramanathan, B., Pazhaniappan Pillai, M., MacDonald, L. and Kirubakaran, R. Final-impression techniques, and materials for making complete and removable partial dentures. *Cochrane Database Syst Rev* 2018; **4**:CD012256.
24. Kamalakidis, S.N., Anastassiadou, V., Sofou, A. and Pissiotis, A.L. Comparative Study of Acceptance and Adaptation to New Complete Dentures, Using Two Construction Protocols. *J Prosthodont* 2016; **25**:536-543.
25. Ye, Y. and Sun, J. Simplified Complete Denture: A Systematic Review of the Literature. *J Prosthodont* 2017; **26**:267-274.

ejprd.org - Published by Dennis Barber Journals. Copyright ©2024 by Dennis Barber Ltd. All rights reserved.